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SUCROSE BASED PRODUCTS THAT CONTAIN HIGH-INTENSITY SWEETENERS AND METHODS FOR PRODUCING THEM
[PRODUITS A BASE DE SACCHAROSE CONTENANT DES EDULCORANTS A HAUT POUVOIR SUCRANT ET PROCEDES POUR LEUR OBTENTION]

L. Daenkindt et al.

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INVENTOR(S)	(72):	L. Daenkindt et al.
APPLICANT(S)	(71):	Raffinerie Tirlemontoise
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Sucrose based products that contain high-intensity sweeteners and methods for producing them

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Goal of the invention

The present invention concerns sucrose based products that contain high-intensity sweeteners that are present in the form of a granular powder and applies to the particular methods for their preparation.

Summary of the state of the art and goals intended by the invention

It is known that, for nutritional or medical reasons, it might be desirable to replace one part of the sucrose in food by high-intensity sweetening substances.

The total substation of sucrose by sweeteners does not completely satisfy the consumer who wants to find in the product he is using the taste of natural sugar to which he has become accustomed. A satisfactory solution has been found for lump sugar in a so-called reduced formula that reduces by a factor on the order of 75% the caloric contribution in comparison with a traditional lump of sugar having the same sweetening strength.

Various examples of such so-called reduced products, which include sucrose and one or several artificial sweeteners, which n the form of lumps are described in the

following documents: EP-A-0 219 150, WO-A-86 06 747, EP-A-0 106 910 and EP-A-0 218 570.

In the case of food sugar in "powder" form the user wants, however, to continue his customary eating habits and it would be desirable to have a product available in powder form which, per unit volume identical to that of sucrose, has the same sweetening intensity but would contain less sucrose. For practically identical volume the caloric strength of such a product would therefore be reduced by a value of at least 30% and preferably on the order of 75% with respect to typical commercial sugar that is practically completely comprised of sucrose, with the exception of certain residual products.

Only the document EP-A-0 052 919 describes a product comprised of sucrose and possibly combined with a sweetening agent that is present in the form of an appropriately packaged powder in order to be dissolved easily and quickly in water. However, this product does not have the same sweetening intensity per unit volume as commercial sugar in powder form and therefore is not suitable for the purpose stated by the present invention.

A product in powder form is also known that is described in the document EP-A-0 036 738 that is essentially described by lower density that that of

commercial sugar. However, this product is essentially comprised of fructose, dextrose and sucrose and therefore does not have a caloric strength that is clearly lower that that of commercial sugar. For this reason it is not suitable for the goal sought by the present invention.

Typical ingredients of the invention

The desired goal is reached in accordance with the invention by a product in power form that contains at least 50% sucrose, with apparent density between 20% and 70%, preferably between 25% and 50% of the apparent density of commercial sugar in powder form, to which one adds a certain amount of additives comprised completely or partially of high intensity sweetening agents and possibly sweetening products other than sucrose, so that overall the product will have the same sweetening power overall as commercial sugar in powder form.

The said non-artificial sweetening products other than sucrose, which can possibly be added to the product according to a particular manner of execution of the invention, are comprised preferably of maltodextrins.

Preferably, one will use maltodextrins obtained by partial hydrolysis of an aqueous solution of starch whose ED is between 2 and 20. ED is the measure of the total quantity of reducing sugars in a hydrolysate of starch that

is calculated as dextrose and expressed as the percentage of the total dry material, the dextrose having an ED equal to 100 and starch an ED equal to 0.

It is known that are exists a certain number of said sweetening agents that are characterized by high sweetening intensity. They are sold under the following commercial names or registered trade marks and others: aspartame, Acesulfame-K, Sucratose, and Alitame. Their sweetening intensity is particularly high and they therefore must be added in very small quantities to the product of the invention. Their contribution to the apparent density of the resulting product is therefore very low and can therefore be considered as negligible.

In practice the condition to be met is therefore that the contribution of high intensity sweetening agents to the sweetening power of the final product, when added to that obtained by the presence in the product of at least 50% sucrose and if necessary obtained by the presence of other non-artificial sweetening products, or the same as that of the final product, has the same sweetening intensity as the same unit volume of commercial sugar in powder form.

This thus makes it necessary to give, while keeping the nature of a granular powder, the non-artificial

ingredients (which are sucrose and if necessary the said other sweetening products), a lower apparent density.

The applicant therefore has decided to perfect some methods to obtain such products.

According to an initial form of implementation, the present invention proposes a method that consists in bringing together a mixture of sucrose that has a grain size less than 0.4 mm and a sweetening agent with

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particularly high sweetening power and in moistening the powder with the help of water in the liquid phase or in vapor phase and in feeding and keeping the moist powder in an agglomeration chamber in the presence of hot humid air, thus causing the agglomeration of the particles made sticky due to the effect of humidity.

The product is then dried, with the help of hot air and then cooled and sifted in order to retain the product with suitable grain size, recycling the particles outside the standard size.

Advantageously, one delivers in a measured way to the agglomeration chamber an amount of water on the order of 10 to 15 with respect to the sugar. The prevailing temperature in this chamber is on the order of 65 to 70°C.

Under these conditions the stay time in the agglomeration chamber is on the order of a few dozen seconds.

During the drying process one advantageously reduces the moisture content of the product to a value less than 1%.

The drying and subsequent cooling can advantageously be carried out with the help of a fluidized bed.

The technique described helps one obtain products that have apparent density values on the order of 40 to 50% of the apparent density value of commercial crystallized sugar.

According to a second form of implementation of the invention, we are proposing a method that allows one to obtain a product according to the invention that is characterized by the presence of maltose dextrin. The implemented technique consists in preparing a solution that contains maltose dextrin, the high-intensity sweetening agent and one part of the sugar that must contain the final product and be injected in the product in the presence of CO_2 in a Fluidized Spray Dryer (FSD) type atomizer. The solution saturated with CO_2 under pressure that is delivered to the unit undergoes sudden expansion forming a mist of fine droplets that are then dried.

The droplets (particles) are then coated with the waste quantity of sucrose, preferably in the form of so-

called "impalpable" sugar. In this way one can obtain a product that has an apparent density on the order of 20 to 40% of the commercial crystallized sugar. The implementation methods that allow one to obtain the product of the invention will be described in more detail with the help of two examples and with reference to the two attached figures respectively that each represents diagrammatically the unit suitable for the invention.

Example 1.

The production method is shown diagrammatically in figure 1. The preparation is carried out in a Fluidized Spray Dryer 1 to which a solution is delivered via a nozzle. Supplying of the nozzle 2 is accomplished initially with a solution taken from a supply tank 3 with injection of CO_2 with the help of a Sparger unit 4 and by passing through a high pressure pump 5. The nozzle 2 is arranged in the center of the air distributor at the top of the drying chamber.

The main air stream is directed to the bottom with the help of air distributor 6. One delivers cooling air around the air distributor and the nozzle in order to protect the upper part of the reaction vessel and the hot air nozzle. Dry sugar is supplied through tube 7 at the same time as the fine materials that are picked up in the second cyclone

8 around the nozzle in the upper part of the drying chamber. The sprayed product is partially dried in the chamber and is sent to a static fluidized bed 9 to continue the drying and accomplish agglomeration in the first dry zone 10. The product is then fluidized in the second drying zone 11 with the help of air that is injected through a perforated wall 12. The dry air of the first and second drying zone leaves the chamber through two openings 13 and 14 that are located in the upper part of the chamber. The fine particles are separated form the air with the help of cyclones 15 and 8 and are recycled.

In this form of implementation it is necessary to use maltose dextrin in order to form the walls of the particles expanded by the CO_2. Indeed, when the particles are formed, the addition sugar reduces the resistance of the walls and, for a certain concentration of sugar, these walls no longer offer sufficient resistance to form particles with sufficiently low density. The maltose dextrin serves to reinforce the walls. The lower the ED value of the maltose dextrin the more the higher the amount of sugar that can be added later in impalpable form. For reasons of taste, in particular to avoid a "cardboard" taste seen for maltodextrins with low ED index, due to the presence of residual fats, one preferably will choose a refined maltose

dextrin with an ED value between 10 and 20. As an illustration, a final product containing 51% sugar and which has an apparent density of 22% compared to commercial sugar was prepared in the following manner.

The feeding supply is comprised of 41.3 kg of water, 50 kg of maltose dextrin (48 kg of dry materials), 7.7 kg of impalpable sugar as well as the necessary quantity of sweetening agent. For 100 kg of this preparation one adds in carefully measured manner 43.3 kg of impalpable sugar. The amount of CO_2 exerts a great effect on the apparent density. A reduction of the flow rate of CO_2 from 45% to 8% causes an increase of the apparent density up to 32%. The amount of sweetening agent with high intensity sweetening strength that must be added depends on the sweetening intensity of this product and the apparent density of the product that one hopes to obtain.

One can also prepare a product comprised of 60% sucrose initially of the following preparation: 50 kg of water, 42 kg of maltose dextrin (40 kg of dry materials), 9 kg of sugar and high intensity sweetening agents. For 100 kg of this preparation one adds in a carefully measured manner 51 kg of sugar in dry powder form. One gets a product that has an apparent density of 28%.

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Example 2.

In this example we attempted to prepare a product consisting of 99.6% sucrose and 0.4% sweetening agent with great sweetening strength which, overall per unit volume, has the same sweetening power as commercial powdered sugar. To do this we used the unit shown in figure 2. In the latter we inserted in continuous or discontinuous mixer 1 both sucrose and sweetening agent with high sweetening capacity (aspartame).

After an average mixing time of 15 minutes the substance is introduced into a storage container 2 from which it is taken through tube 23 to be inserted in carefully measured manner into a vertical agglomeration chamber 3. In this same chamber one introduces air heated by steam into tube 4, the steam being itself produced through adequate units.

In the case indicated, the air heated by the reheater 6 is propelled through blower 5 onto the rotating plate arranged at the top of the chamber; moistening is produced by the hot water injected via tube 7.

The material is held in suspension in the agglomeration chamber in a moist atmosphere. The desired apparent density is produced by simple agglomeration of the particles with one another.

In the first section of a drier/cooling device 8, supplied with hot air through blower 9, the drying is carried out with the dry air blowing in from blow and through a sieve 11 that transports the material from one end to the other of chamber 8.

Next, the material is cooled in the second section of chamber 8, is supplied through blower 10, the cooling being done with the cold air that in this case is blown in from below and through sieve 11.

One obtains the desired grain size by sifting over a sieve 12. The separated fine particles are recycled through tube 13 to chamber 12.

Sampling of air is also provided at the outlet of chamber 3 and from drier/cooling unit 8. The air which necessarily brings along small particles is collected in tube 15; the particles are separated in cyclone 16 and recycled through tube 13 and 14 as indicated.

By employing such a set of equipment we obtained a product of good quality in the following manner: impalpable sugar that contains 0.4% aspartame is blown into chamber 3 at the rate of 400 kg/h at the same time as 60 l/h of water at 60°C. One obtains a product that has an apparent density of 46% compared with the apparent density of commercial powdered sugar.

The advantage of the two described techniques is in obtaining a product of good grain size, which has satisfactory qualities from the standpoint of free flow. These products, which are clearly less calorie rich per unit volume than commercial sugar, are comparable to crystalline sugar with regard to appearance, taste, sweetening power and gustatory impression.

CLAIMS

1. Product in powder form characterized in that it contains at least 50% sucrose, with apparent density between 20% and 70%, preferably between 25% and 50% of the apparent density of commercial powdered sugar, to which one adds a quantity of additives comprised completely or partially of sweetening agents with high sweetening power and possibly of sweetening products other than sucrose, in such a manner that the product overall has per unit volume the same sweetening power as commercial powdered sugar.

2. Product according to claim 1 characterized in that it contains sweetening products other than sucrose that are comprised of maltodextrins.

3. Product according to claim 2 characterized in that one uses maltodextrins obtained by partial hydrolysis of an aqueous solution of starch, whose ED is between 2 and 20.

4. Product according to any of the claims 1 to 3 characterized in that one uses as high intensity sweetening agents the products sold under the trade names: Aspartame, Acesulfame-K, Sucralose, and Alitame.

5. Method of obtaining products according to any of the claims 1 to 4 characterized in that it consists in agglomerating a mixture of sucrose that has a grain size less than 0.4 mm, preferably 0.2 mm and a sweetening agent with particularly high sweetening power and in moistening the powder with the help of water in the liquid or vapor phase and in feeding and holding the moist powder in an agglomeration chamber in the presence of hot moist air, thereby causing the agglomeration of particles that have been made sticky due to the effect of the moisture, after which the product is dried with the help of hot air and then cooled and sifted in order to keep the product having the proper grain size, recycling the particles that are outside the normal range.

6. Method according to claim 5 characterized in that one measures in the agglomeration chamber a quantity of water on the order of 10 to 15% with respect to the sugar, the prevailing temperature in this chamber being on the order of 65-70°C, the holding time in the said agglomeration chamber being on the order of a few dozen seconds.

7. Method according to any of the claims 5 or 6 characterized in that during drying one reduces the moisture content of the product down to a value less than 1%.

8. Method according to any of the claims 5 to 7 characterized in that the drying and the subsequent cooling are conducted with the help of a fluidized bed.

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9. Method according to any of the claims 5 to 8 characterized in that the products produced that have apparent density values on the order of 40 to 50% of the apparent density value of commercial grade crystallized sugar.

10. Method for producing products according to any of the claims 1 to 4 characterized in that one prepares a solution containing maltodextrin, a high intensity sweetening agent and one part of the sugar that must contain the final product and inject it in the presence of CO_2 into a Fluidized Spray Dryer (FSD) type atomizer where it undergoes sudden expansion and forms a mist of fine particles/drops, after which the residual amount of sucrose is then coated in the form of so-called "impalpable" sugar around the particles/droplets.

11. Method according to claim 10 characterized in that one obtains a product that has an apparent density on the order of 20 to 40% of commercial grade crystallized sugar.

Two figures.

Figure 1

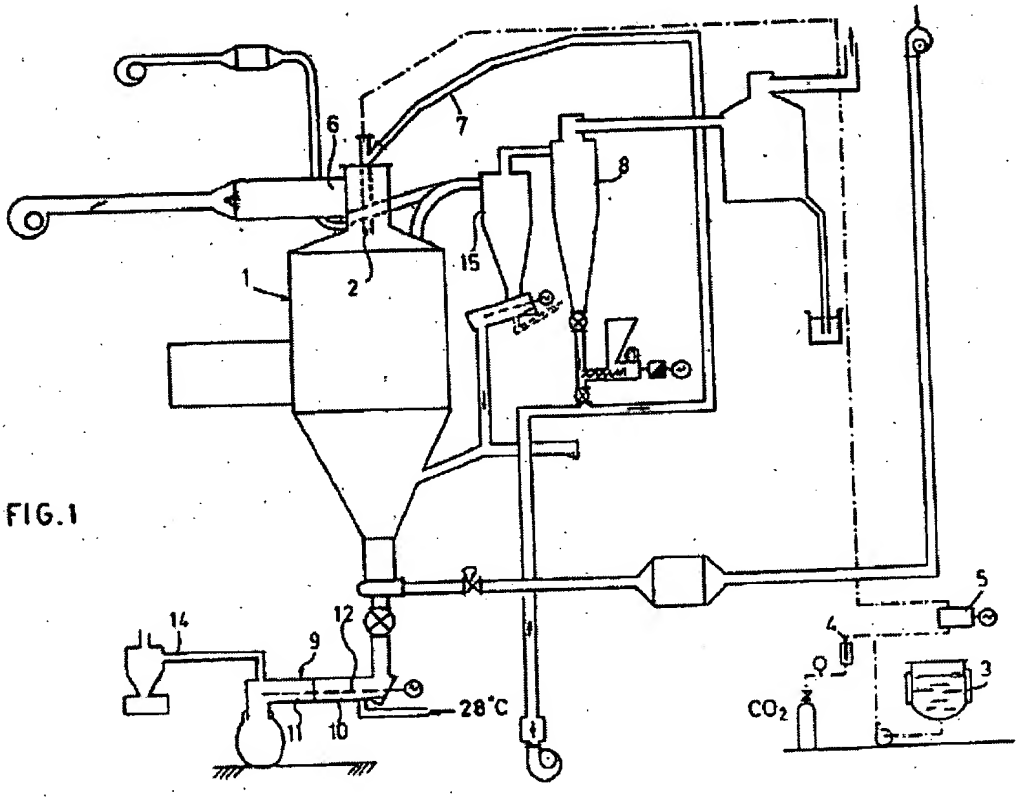

FIG.1

Figure 2

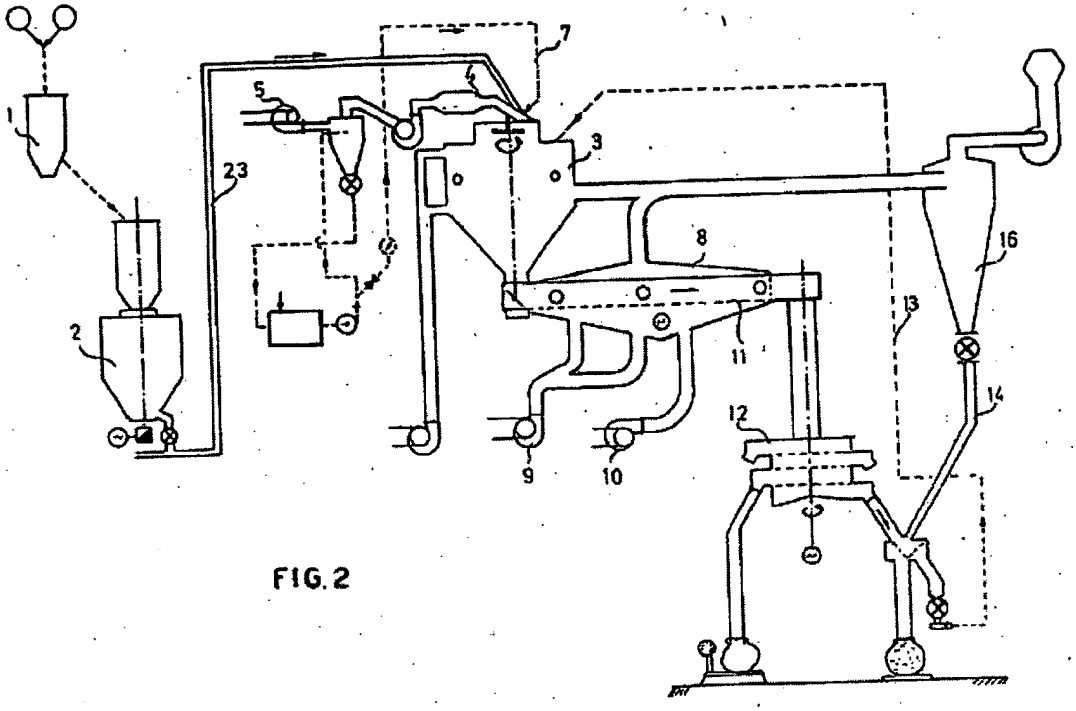

FIG.2